

## CLAIMS

What is claimed is:

- 1 1. A method of producing nitride based heterostructure devices comprising the  
2 steps of:  
3 providing a substrate; and  
4 applying a quaternary layer over the substrate wherein the quaternary layer  
5 includes In.
- 1 2. The method of claim 1, wherein the substrate comprises one of the group  
2 comprising sapphire, SiC, ZnO, a spinel substrate, Si, anodized alumina, and AlN.
- 1 3. The method of claim 1, wherein the quaternary layer further includes Al, Ga  
2 and N.
- 1 4. The method of claim 1, further comprising applying a second layer positioned  
2 between the substrate and the quaternary layer.
- 1 5. The method of claim 4, wherein the second layer includes GaN.
- 1 6. The method of claim 1, wherein the quaternary layer includes the compound  
2 AlInGaN.

1 7. The method of claim 6, wherein the quaternary layer includes about a 20% to  
2 30% molar fraction of Al.

1 8. The method of claim 7, wherein the quaternary layer further includes about a  
2 2% to 5% molar fraction of In.

1 9. A method of producing nitride based heterostructure devices comprising the  
2 steps of:  
3 providing a substrate;  
4 applying a first layer including GaN over the substrate;  
5 applying a ternary layer over the first layer, wherein the ternary layer  
6 includes a compound selected from the group comprising AlGa<sub>1-x</sub>N and InGa<sub>1-x</sub>N; and  
7 applying a quaternary layer over the ternary layer, wherein the quaternary  
8 layer includes AlInGa<sub>1-x-y</sub>N.

1 10. The method of claim 9, wherein the substrate includes one of the group  
2 comprising sapphire, SiC, ZnO, a spinel substrate, Si, anodized alumina, and AlN.

1 11. The method of claim 9, wherein the quaternary layer includes about a 20% to  
2 about 30% molar fraction of Al.

1 12. The method of claim 11, wherein the quaternary layer further includes about a  
2 2% to about 5% molar fraction of In.

1 13. A nitride based heterostructure device comprising:  
2 a substrate;  
3 a first layer applied over the substrate; and  
4 a quaternary layer applied over the first layer wherein the quaternary layer  
5 includes In.

1 14. The device of claim 13, wherein the substrate includes one of the group  
2 comprising sapphire, SiC, ZnO, a spinel substrate, Si, anodized alumina, and AlN.

1 15. The device of claim 13, wherein the first layer includes GaN.

1 16. The device of claim 13, wherein the quaternary layer includes AlInGaN.

1 17. The device of claim 13, wherein the device is used as one of the group  
2 comprising of a field effect transistor, an ultraviolet light emitting diode, a visible  
3 light emitting diode, an ultraviolet light photodetector, a visible light  
4 photodetector, a dual infrared light emitter and detector, a dual ultraviolet light  
5 emitter and detector, a pyroelectric device, a piezoelectric device, a strain sensor,  
6 a stress sensor, and a plasma wave electronics device.

1 18. The device of claim 13 further comprising a ternary layer applied between the  
2 first layer and the quaternary layer.

1 19. The device of claim 18, wherein the ternary layer includes a compound  
2 selected from the group comprising AlGaN and InGaN.